

The process can be used to provide increased yields of ethylene, propylene and high quality motor fuels containing aromatics from low value refinery, petrochemical or other chemical synthesis streams or other naphtha streams, especially in catalytic cracking reactors, e.g., conventional FCC units which ordinarily employ heavier feeds such as deep cut gas oil, vacuum gas oil, thermal oil, residual oil, cycle stock, whole top crude, and the like.

A key element of the present invention is its use of a catalyst comprising a zeolite which zeolite itself has been modified by treatment with a phosphorus compound, combined with a substantially inert matrix material.

Claim 1 has been amended to more clearly specify that the catalyst comprises a zeolite component which zeolite is necessarily treated with a phosphorus compound. Support for this limitation is found at page 9, lines 28-30 of the Specification.

Claim 4 has been amended to include the term "molar" to modify silica/alumina ratio support for which is found at page 8, line 30.

Applicants note the Examiner's objection to the declaration as defective for failing to identify the citizenship of each inventor. Applicants are in the process of obtaining signature of a revised compliant declaration which will be provided shortly.

Applicants also acknowledge the Examiner's objection to the Specification as comprising upper lines on some pages which are obscured. In order to remedy this shortcoming, the Specification has been amended.

Rejections Under 35 U.S.C. § 112

Claim 4 stands rejected under 35 USC 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner contends Claim 4 is indefinite because the basis for silica/alumina ratio is not identified.

This rejection is respectfully traversed.

As noted above, Claim 4 has been modified to refer to silica/alumina molar ratio. Accordingly, it is respectfully urged that Claim 4 is sufficiently definite to meet the

requirements of 35 USC 112, second paragraph because C₃ components other than propylene, e.g., propane, can be present in the C₃ fraction.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present claims meet the requirements of 35 USC 112, second paragraph. Accordingly, withdrawal of this rejection is respectfully requested.

Rejections Under 35 U.S.C. § 102(e)

Claims 1, 2, 5 and 8 have been rejected under 35 U.S.C. § 102(e) as being unpatentable over U.S. Patent No. 6,069,287 to Ladwig et al. (Ladwig). The Examiner cites Ladwig as disclosing a process for selectively producing C₂-C₄ light olefins and aromatics by contacting a 65°F to 430°F boiling range naphtha with medium pore zeolite such as ZSM-5 and ZSM-11 preferably having an inactive inorganic matrix, which matrix may be modified with phosphorus. Ladwig is also cited as introducing steam concurrently with the naphtha feed. The Examiner argues that a teaching "that aromatics in the heavy naphtha product may be recycled indicates that aromatics are produced in the process."

This rejection is respectfully traversed.

First, Ladwig fails to disclose or suggest the present invention's catalyst comprising "substantially inert matrix material." Instead, the reference teaches use of an inorganic oxide matrix which is preferably "not catalytically active and . . . comprised of oxides of silicon and aluminum. Ladwig teaches that this "matrix material may also contain phosphorous or aluminum phosphate" (column 4, lines 42-43). In contrast, the presently amended claims specify that it is the zeolite component of the catalyst which is necessarily treated with phosphorus compound.

All of Ladwig's examples fail to disclose the type of matrix, if any, which was used. Moreover, it is submitted that the inorganic oxide matrix component described by Ladwig fails to disclose or even suggest the present "substantially inert matrix material" of the present claims. Instead, Ladwig teaches that the inorganic oxide matrix "will be comprised of oxides of silicon *and* aluminum (column 4, lines 34-35, emphasis added) and further teaches the preferred use of "separate alumina phases" in the matrix, including "aluminum oxyhydroxides, g-alumina, boehmite, diaspore, and transitional

aluminas such as a-alumina, b-alumina, g-alumina, d-alumina, e-alumina, k-alumina, and r-alumina" (column 4, lines 35-40). In contrast, the present specification prefers "silica and clay" while limiting alumina in its active form to less than 20 wt.% of the total matrix material (page 10, line 26 to page 11, line 3). No such limitations on active forms of matrix material are disclosed or suggested by Ladwig.

Secondly, Ladwig's teaching with respect to the inclusion of phosphorus neither suggests nor discloses the subject matter of the present application whose claims all clearly require "ZSM-5, ZSM-11 or combinations thereof treated with phosphorus-containing compound." Instead, Ladwig merely states "[t]he *matrix material* may also contain phosphorous or aluminum phosphate" (column 4, lines 42-43, emphasis added).

Thirdly, Ladwig's teaching of aromatics recycling does not necessarily imply that such aromatics are themselves products of Ladwig's hydrocarbon conversion process. Ladwig teaches that the feed itself used in the process "may also contain naphthenes and aromatics" (column 2, lines 52-53). Additional aromatics are therefore not necessarily made during Ladwig's process. Such an unclear and indefinite teaching is clearly inappropriate as the basis of an anticipation rejection..

Given the shortcomings of the reference in disclosing the substantially inert matrix material of the catalyst employed in the present invention, its failure to disclose a phosphorus-treated *zeolite* and the lack of a specific disclosure of aromatics in its naphtha conversion process, it is respectfully urged that Ladwig fails to disclose or suggest the presently claimed subject matter.

Accordingly, it is respectfully submitted that the present claims meet the requirements of 35 USC 102(e) and withdrawal of the rejection thereunder is therefore requested.

Rejections Under 35 U.S.C. § 103

Claims 1-10 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ladwig. The Examiner repeats his arguments made above with respect to claims 1, 2, 5

and 8 and further contends that Ladwig shows a silica to alumina molar ratio of less than 75 in amounts ranging from 10 to 50 wt.% of total catalyst composition (Claims 3 and 4), process conditions (Claim 6), propylene to ethylene ratios of 1.9 to 5.8% (Claims 7 and 9). The Examiner admits the phosphorus amount limitation of Claim 3 is not disclosed but argues it would be obvious to one skilled in the art. Similarly, the WHSV limitation of Claim 6 and product compositions of Claims 7, 9 and 10 are argued as obvious to the skilled person.

This rejection is respectfully traversed.

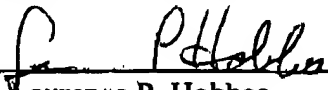
In view of Ladwig's failure to disclose the substantially inert matrix material of the catalyst employed in the present invention, Ladwig's failure to disclose the necessary production of aromatics in its naphtha conversion process, and Ladwig's failure to disclose phosphorus-treated zeolite, it is respectfully submitted that Ladwig fails to disclose or suggest to one skilled in the art the presently claimed subject matter.

Accordingly, it is respectfully submitted that the subject matter of the presently amended claims is neither disclosed nor suggested by the Ladwig reference. In view of this, withdrawal of the rejection under 35 USC 103(a) is respectfully requested.

CONCLUSION

Applicants respectfully submit that the foregoing arguments obviate all of the outstanding rejections in this case and place the application in condition for immediate allowance. Allowance of this application is therefore earnestly solicited.

Respectfully submitted,

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